9/07/21 Physics :-

① Radius of circular path by the proton in the magnetic field can be described as

$$r = \frac{1}{B}\sqrt{\frac{2mV}{q}}$$

B = Magnetic field

V = Potential difference

$r \propto \sqrt{V}$

Let r be radius

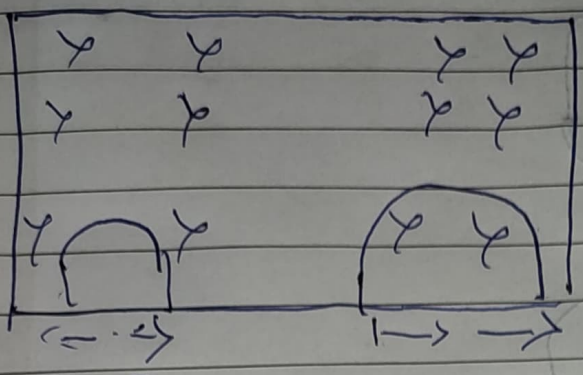
Potential difference is V

r be radius when potential difference is 2V

$$\frac{r}{r_2} = \sqrt{\frac{V}{2V}} = V_2$$

$r = \sqrt{2}r$

2



Proton

Mass of deuteron = 2m (1 proton + 1 neutron)

Mass of proton = m (1 proton)

$$R(\text{proton}) = \frac{mv}{qB}$$

$$R(\text{deuteron}) = \frac{(2m \times v)}{qB}$$

$$\text{Ratio}\left(\frac{\text{proton}}{\text{deuteron}}\right) = \frac{1}{2}$$

(3) Cyclotron

Device use to accelerate charged particles like protons deuterons & α particles etc to very high energies

$$qvB \sin 90^\circ = \frac{mv^2}{r}$$

$$T = \frac{2\pi r}{v} = \frac{2\pi}{v} = \frac{mv}{qB} = \frac{2\pi m}{qB}$$

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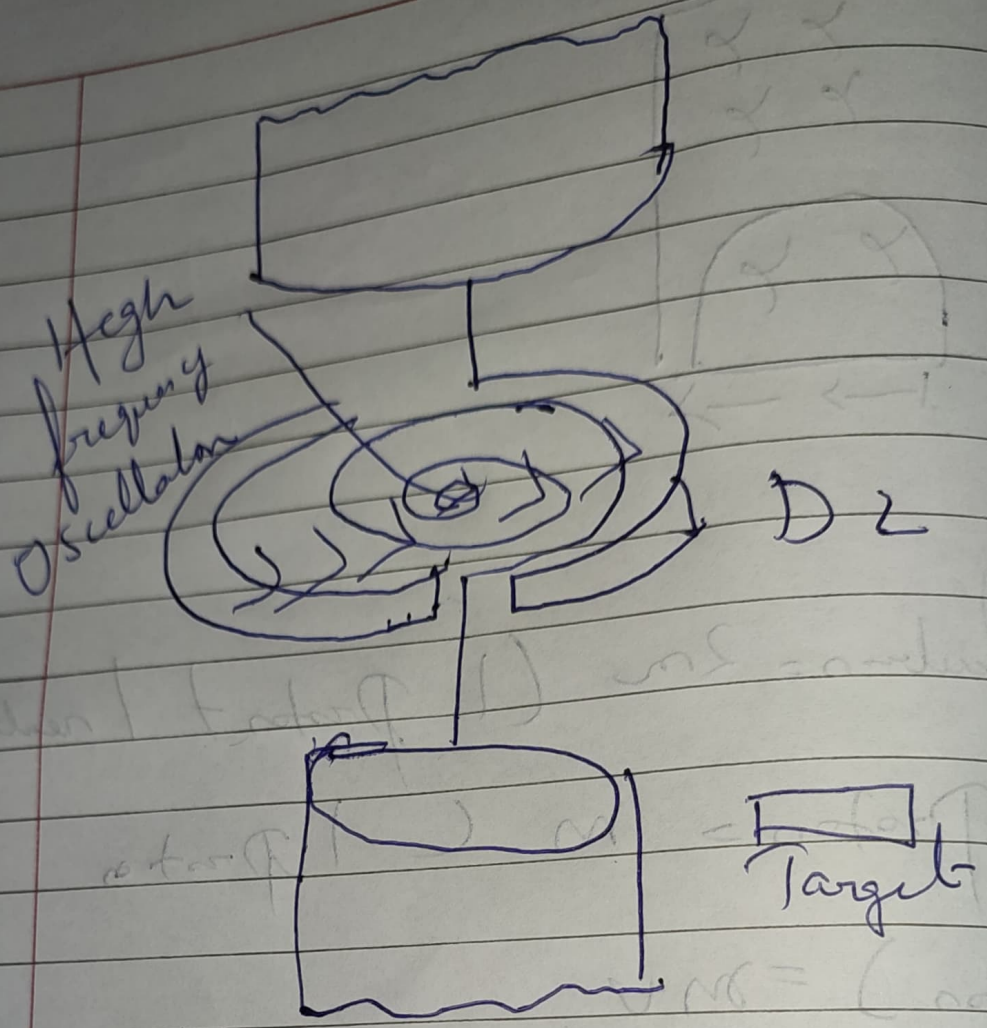
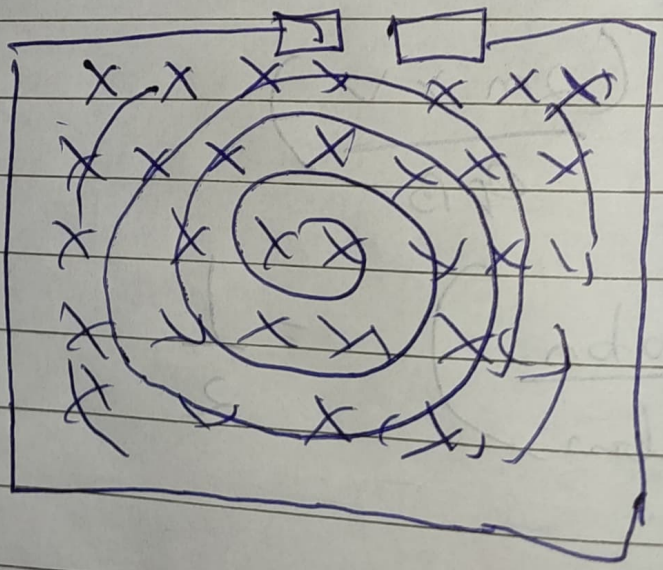




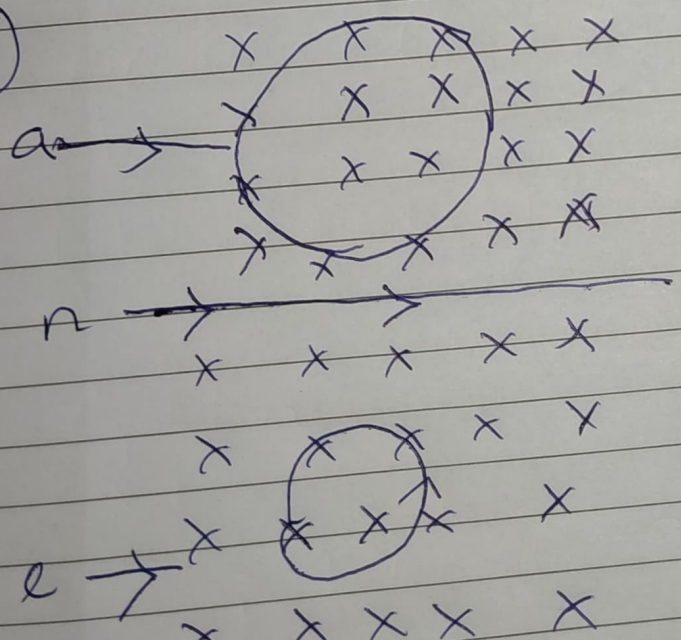
Particles will not accelerate with same cyclotron frequency of proton is twice than frequency of alpha particle

$$V = \frac{Bqr}{m} \rightarrow V \propto \frac{q}{m}$$

$$V_p \propto \frac{q}{m}$$

$$V_\alpha \propto \frac{2q}{4m} \qquad V_\alpha \propto \frac{q}{2m}$$

(5)



Alpha electron will move in clockwise direction and electron will move in anticlockwise direction according to right hand rule